Project Introduction

This proposal will develop an innovative architecture and concept of operations that permits reliable, safe, and repeated sampling of small bodies. The Lofted Regolith Sampling (LoRS) architecture is based on advanced astrodynamics and autonomy that is robust to target-body uncertainties and is adaptive during operations. The LoRS architecture is based on several key phases that ultimately lead to a thorough characterization of the target body and collection of multiple samples while avoiding complex and highly unpredictable landing requirements. The first phase of this characterization is the estimation of the body's gravitational field and remote sensing of the NEO surface. After sufficiently characterizing the body, the second phase of the proposed architecture is to disturb material on the surface of the small body such that it is lofted into orbit about the body. This disturbance can be initiated with a variety of chemical explosions, kinetic impactors, or other forces which will be evaluated during the proposed effort. The third phase is to remotely characterize the lofted material to identify key attributes such as size and composition. The fourth phase of operations is for the orbiting spacecraft to approach a specific portion of the debris field and collect physical samples from the NEO. Once samples have been collected in orbit, the vehicle can further evaluate the samples on-board, identifying key constituents etc., and return this information to terrestrial scientists.

Primary U.S. Work Locations and Key Partners

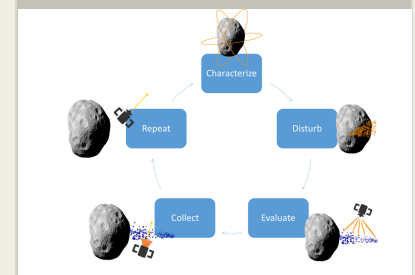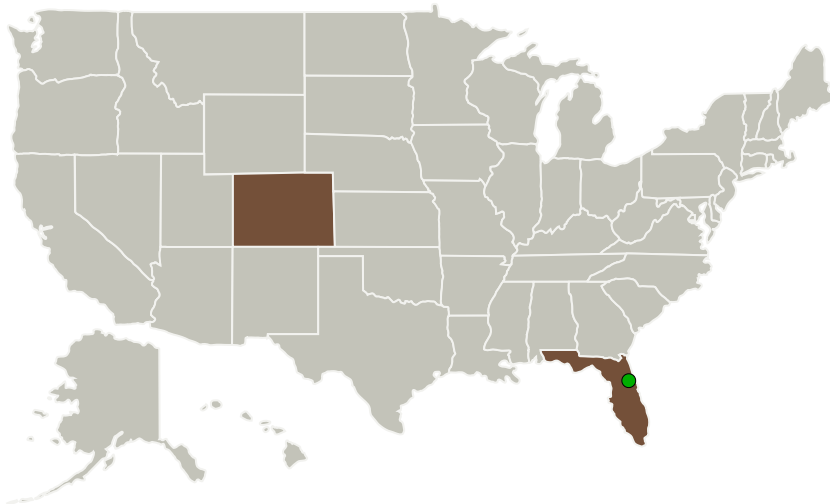A Robust Architecture for Sampling Small Bodies, Phase I

Table of Contents

Organizations Performing Work	Role	Type	Location
Advanced Space, LLC	Lead Organization	Industry	Boulder, Colorado
🟢 Kennedy Space Center(KSC)	Supporting Organization	NASA Center	Kennedy Space Center, Florida
University of Colorado Boulder	Supporting Organization	Academia	Boulder, Colorado

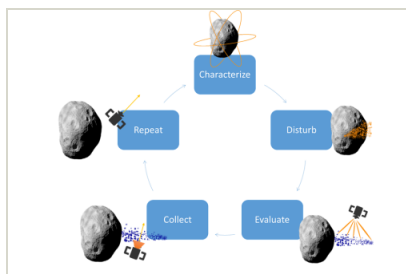| Primary U.S. Work Locations	
Colorado	Florida

Project Transitions

▶ **June 2015:** Project Start

✔ **June 2016:** Closed out

Closeout Summary: A Robust Architecture for Sampling Small Bodies, Phase I Project Image

Closeout Documentation:
- Final Summary Chart Image*(https://techport.nasa.gov/file/138752)*

Images

Briefing Chart Image
A Robust Architecture for Sampling Small Bodies, Phase I
(https://techport.nasa.gov/image/126641)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Advanced Space, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management
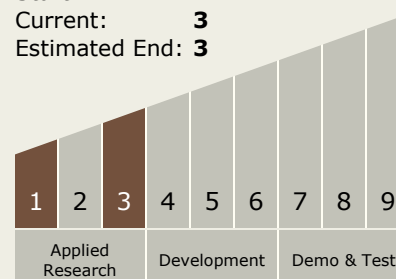
Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Jay Mcmahon

Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **3**

1	2	3	4	5	6	7	8	9
Applied Research			Development			Demo & Test		

Technology Areas

Primary:

- TX07 Exploration Destination Systems
  - TX07.1 In-Situ Resource Utilization
    - TX07.1.1 Destination Reconnaissance and Resource Assessment

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System